

WHAT IS CLAIMED IS:

1. A multi-step local dry etching method for a SOI wafer including:

a first step of locally dry etching the surface of an active silicon layer by a small diameter nozzle thereby flattening unevenness present on the surface of the active silicon layer of the SOI wafer, and

a second step of locally etching the active silicon layer flattened by the first step by a large diameter nozzle thereby reducing the layer to a required layer thickness.

2. A local dry etching method according to claim 1, which conducts each local dry etching in the first step and the second step by scanning each of the nozzles for blowing out an activated species gas at a controlled relative speed along the surface of the active silicon layer while blowing the gas on the surface of the active silicon layer.

3. A local dry etching method according to claim 1, wherein the relative speed is controlled by numerical value control, and the pitch for the scanning in the second step is made larger than the pitch for the scanning in the first step.

4. A local dry etching method according to claim 1, wherein the activated species gas comprises a SF_6 gas, NF_3 gas, CF_4 gas or a gas mixture thereof, or a gas mixture thereof with oxygen, which is activated by plasmas.

5. A multi-step local dry etching apparatus including,
a first vacuum chamber,
a second vacuum chamber,
a small diameter nozzle opened in the first vacuum chamber,
a large diameter nozzle opened to the second vacuum chamber
and having a diameter larger than that of the small diameter nozzle,

an activated species gas generator for generating activated species gases to be blown out of each of the nozzles,
each of feeding devices disposed in each of the vacuum chambers, for providing a relative speed along the surface of the SOI wafer between the SOI wafer and each of the nozzles described above to conduct scanning, and

a transportation device for taking out the SOI wafer after completion of the planarization processing from the first chamber and transporting the same into the second chamber in which

the surface unevenness is removed by etching the active silicon layer of the SOI wafer in the first vacuum chamber and

the active silicon layer is etched to a required layer thickness in the second vacuum chamber.

6. A multi-step local dry etching apparatus according to claim 5, wherein

each of the first vacuum chamber and the second vacuum chamber is provided as a single unit or plural units relative to the single transportation device.